ANNAGNPS WATERSHED MANAGEMENT DATA

Introduction

Each field has an assigned management sequence. Different fields may use the same management sequence but may or may not be in phase with each other as to the rotation year each are in at any given time; i.e., two different fields may have identical rotation periods but not performing the same yearly operations in the same year. For example, one field may begin with a corn-corn-wheat rotation while a second field may use the same management sequence and begin at the same time but with a wheat-corn-corn rotation.

The design for the management input in AnnAGNPS includes a sequence of scheduled operations that are both activities (operations, applications, runoff curve number, etc.) and events (date) that may affect any combination of the hydrologic, erosivity, or chemical applications and occurs entirely within one day. By definition, a management sequence is a set of events within a cyclic unit of time (rotation period) that is measured in whole years and may consist of one or more calendar years. The management sequence includes every operation that occurs within the rotation period. A management sequence is the sequence of management scheduled events that has logical initial & final events, has no internal conflicts, and the initial event can successfully follow the final event in perpetuity. An example of an illogical management sequence is one that consists of only a single year that contains a harvest operation without a planting operation preceding it within the management sequence.

An event is every management operation, application, change in runoff curve number, etc. that is scheduled to occur within the same day.

A management schedule consists of one or more events that can occur for use in the management sequence. A single or a series of events can be defined by a management schedule. A single event can be defined for one or more combinations of activities that occur on the same day. A schedule of more than one event can be defined as a series of events that are linked by some common logic, such as all corn operations in a single year or all events associated with cultivation practices after planting. A series of events could also be defined by a management schedule for all of the activities associated within a rotation.

Most days within a management sequence do not have an event scheduled; i.e., the land manager simply watches the "grass" grow. However, one, and sometimes more compatible, event(s) are periodically scheduled within the management sequence. For example, a planting management operation may be scheduled early in the spring when the first of the frost free days are expected. An example of an event consisting of two activities scheduled on the same day could be a planting operation coinciding with a fertilizing application. Each could be two separate activities, yet they can be scheduled for the same day.

The cyclic nature of a rotation period (management sequence) implies that the hydrologic, erosivity, or chemical applications within a field are explicitly known at all times. The management sequence selected for a field must clearly & completely define all events without any conflicts. No initialization assumptions should made within AnnAGNPS; all should be extracted from the input.

Each event within the management sequence signifies a possible change in the hydrologic, erosivity, or chemical applications within a field. These changes must be explicitly contained in the input. For example, a SCS runoff curve number II (Cn-II) must be explicitly noted within each event that signifies a change in Cn-II. The Cn-II must be explicitly given within the first event of each management sequence. There are no internal defaults for Cn-II within AnnAGNPS. Blank fields in the Cn-II field in the Management Schedule Data section default to the last previous explicitly noted Cn-II input value within the same management sequence whether the sequence explicitly defines the rotation period by input or is implicitly defined during AnnAGNPS execution. Since management sequences are cyclic, the last event within the management sequence implies what the hydrologic, erosivity, & chemical applications are appropriate during the first part of the first year in the management sequence prior to its first scheduled event.

Rotation Period Methods

The design of the watershed management data sections allows maximum flexibility for scheduling rotation periods. This flexibility includes a scheme where each unique & complete rotation period is entirely defined by one and only one Management Schedule ID in the Management Sequence Data section. This scheme may be best for beginning

users that want to set an entire series of events within a single Management Schedule ID that defines a complete rotation period. This would help minimize potential conflicts of operations, such as harvesting before planting. A second scheme would include defining a Management Schedule ID for a logical series of events that do not necessarily define a complete rotation period. A unique rotation period would be defined by sequencing separate management schedules as a management sequence. This would be more flexible, but would increase the chance of user-created errors. A third scheme would include defining a single Management Schedule ID for each event. Unique rotation periods would be completed by sequencing a set of simple management schedules. This would provide the most flexibility, but the chance of user-created errors would be even greater. A fourth scheme would include a mixture of the previous options that would group common events into Management Schedule IDs for eventual use as part of a management sequence. The fourth scheme should only be used by experienced personnel.

Rotation Synchronization

The relative rotation year for each Field ID is synchronized to occur at year 1 CE (AD) regardless of the specified beginning simulation year and number of initialization years. For example, if the input for a Field ID called "Field_1" contains:

1. Relative Rotation Year is in the 2nd year of the management sequence;
2. Management sequence is for a four year rotation.

Then "Field_1" would always be in year 2 of its rotation (management sequence) for year 2000 CE regardless of the number of initialization years and the beginning simulation year. When there are two initialization years, then "Field_1" would be in year 4 of its rotation for the first initialization year when the beginning simulation year is 2000 CE. This algorithm is:

Let, y = calendar year + relative rotation year – 1

If, calendar year is less than zero and y is equal to or greater than zero, then y = y + 1

Then, r = Modulo (y / number of rotation years)

When y is greater than zero and if r is greater than zero; then, the rotation year (r) for the calendar year is equal to "y"; otherwise if r is equal to zero, then the rotation year for calendar year is equal to the number of rotation years.

When y is less than zero and if r is greater than zero; then, the rotation year for the calendar year is equal to the number of rotation years less "y"; otherwise if r is equal to zero, then the rotation year (r) for calendar year is equal to one.

Note: The modulo of x divided by n is equal to the integer remainder of x divided by n where x is an integer number and n is a positive integer greater than zero.

Data Section Revisions

Certain revisions are necessary in the AnnAGNPS Input Editor to make the management sequencing features easier to understand and define. Table 1 shows the section headers that are to be changed and listed in the following order.

Table 1: Management data section headers revisions

Management Data Section Headers	
From Version 3.2	**To Version 3.3**
FIELD DATA	MANAGEMENT FIELD DATA
FIELD MANAGEMENT DATA	MANAGEMENT SEQUENCE DATA
OPERATIONS DATA	MANAGEMENT SCHEDULE DATA
OPERATIONS REFERENCE DATA	MANAGEMENT OPERATION DATA

The Editor is also to be revised as follows:

1. Change the section data headers as shown in Table 1.
2. Everywhere that "Identifier" or its equivalent is shown in a menu, change to "ID".
3. All section header names are to be upper case.

AnnAGNPS Input Editor Version 3.3 must be able to read prior versions and convert its output to Version 3.3.

The data check within AnnAGNPS is to be brought into complete & accurate accordance with the use of its field, management sequence (rotation), management scheduling & management operation features. For example, check that each set of events begins with a relative rotation year 1, has a logical initial event, is sequentially continuous throughout its management sequence without a conflict, has a logical final event, and that it can continue in perpetuity. Also, the first time a Management Sequence ID is used to start a set of events, a runoff curve number ID is to be explicitly shown.

Data Check

Complete rotation periods are calculated in the subroutine "Initialize_Cell_Parameters" which is called in the subroutine "Data_Prep". "Data_Prep" is where most of the preprocessing data checking is to be done (only runtime error trapping should be done past this point). This is where data checks for all rotation-related logic should have been done, but very little actual is. The subroutine "Data_Prep" needs considerable improvement.